

Providing Information to the Water Well, Underground Injection Control (UIC) & Underground Hydrocarbon Storage (UHS) Industries in Kansas and other Partners Interested in these Operations, the Environment and Energy

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Spring 2015

Induced Seismicity by Mike Cochran, P.G.

There has been a significant development concerning the induced seismicity issue here in Kansas. Please see the links listed to several news articles concerning the Kansas Corporation Commission (KCC) issuing an order to several oil production companies to reduce injection volumes and pressures in Class II Underground Injection Control (UIC) oilfield disposal wells in seismically active areas of Harper and Sumner Counties. The order also requires daily measurement/monitoring of injection pressure and injection volume.

The links to the news articles and to the KCC Order are as follows:
Newspaper articles:

<http://www.kansas.com/news/local/article15413117.html>
<http://cjonline.com/news/2015-03-19/utilities-regulator-orders-disposal-well-reduction>

Link to the KCC Order:

<http://cjonline.com/news/2015-03-19/utilities-regulator-orders-disposal-well-reduction>

Some Water Program Well Facts

Shown below, by quarter, are the number of constructed, reconstructed and plugged water wells reported to KDHE for the calendar year 2014.

Quarter	Constructed	Reconstructed	Plugged
1	1021	16	439
2	1503	33	526
3	1409	9	476
4	776	10	457

Geology & Well Technology Staff Changes

by Deb Biester

Richard Harper, P.G. Retires from KDHE

Richard Harper, P.G., Unit Chief of Water Wells and Technical Support for KDHE, Bureau of Water, Geology & Well Technology Section retired on Monday, March 16, 2015, after 25 years of service with the State of Kansas. Richard graduated from Emporia State with a BS in Bachelor Degree in Earth Science in 1978. He worked in the Oil & Gas industry for a while and then in 1988 he started with the Division of Water Resources, Department of Agricultural and was with them for three years before coming to KHDE, Bureau of Water.

Richard served on the Kansas Ground Water Association (KGWA) Board of Directors for many years.

We congratulate Richard on his retirement and we wish him well.

For help with water well related questions, until this vacancy is filled, you should contact:

Mike Cochran at (785) 296-5560; mcochran@kdheks.gov or

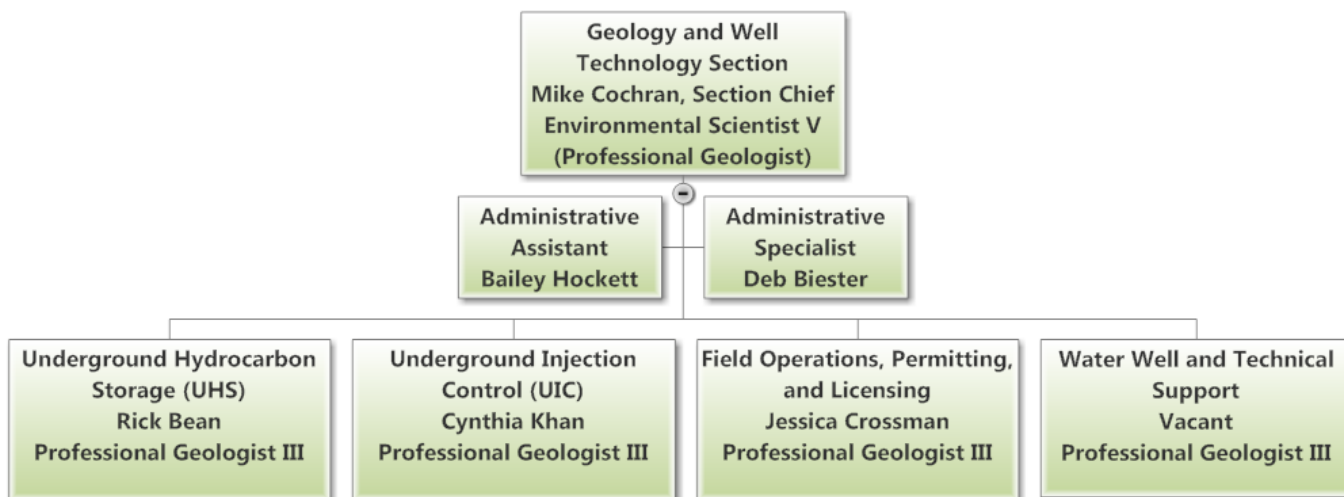
Deb Biester at (785) 296-5524; dbiester@kdheks.gov

Jeffrey Hand Resigns; Jessica Crossman Accepts Position

Jeffrey Hand, Environmental Scientist, Unit Chief of Field Operations, Permitting and Licensing, Geology & Well Technology Section, left KDHE in February 2015 to accept a position in private industry. We wish Jeffrey the best in his new position.

Jessica Crossman has joined the Section as a Professional Geologist III. Jessica came to us from the KDHE's Bureau of Environmental Remediation. (see more on page 6)

Here is the current Geology and Well Technology Organizational Chart:



WATER WELL CONTRACTOR LICENSE RENEWALS FOR THE YEAR 2015-2016

by Deb Biester

On May 15, 2015, Water Well Contractor License Renewal letters will be sent out. The following documents will be due in our office by June 30, 2015:

1. Water Well Contractor Renewal Application

<http://www.kdheks.gov/waterwell/download/WWC-1R.pdf>

2. Rig Application

<http://www.kdheks.gov/waterwell/download/WWC-3.pdf>

3. Your check or money order

- A. \$100 for contractor license
- B. \$ 25 for each rig registered

Remember:

- ♦ Make sure and **SIGN** your application and **ATTACH YOUR CHECK** or your application will be returned and processing will be delayed until we receive the returned items back.
- ♦ List all drillers, on the application, who work for you.
- ♦ Make sure you have 8 CEU's acquired by July 1, 2015. (New contractors, with less than a year licensure, will not need the 8 CEU's their first year)

[For more information on CEUs, go to: http://kgwa.org/ceu.htm](http://kgwa.org/ceu.htm)

Please fill out all forms completely.

If we have not received the above mentioned items in our office by July 1, 2015, your license may be subject to revocation.

Thank you and we look forward to working with you in the 2015-16 licensing period.

THE IMPORTANCE OF INTERPRETATION AND HISTORICAL COMPARISON OF LOGGING RESULTS ON UNDERGROUND HYDROCARBON STORAGE WELLS AND CAVERNS

By Rick Bean, P.G.

Logging and testing are essential components of the Underground Hydrocarbon Storage (UHS) Program to ensure that operations are safe and protective of the public and environment. The regulations for the UHS Program (commonly known as Article 45) became effective on April 1, 2003 and required the liquid hydrocarbon salt cavern storage industry to complete various types of logging and testing on wells/caverns generally at a frequency of five to ten years after April 1, 2003. This first cycle of logging and testing was completed on wells/caverns as required by the regulations. Many of the wells/caverns have, or are now going through the second or third cycle of logging and testing. In order to fully understand the well/cavern history and growth it is imperative to not only interpret results from the current logging events, but to actually compare those results to historical logs to better understand the well/cavern dynamics. Although there are numerous types of logging and testing that can be performed on a well/cavern at any given time there are generally four primary logs and one test (mechanical integrity testing) that are required by the regulations. This article will focus on the logging activities required by the regulations including the following:

Kansas Administrative Regulation (K.A.R.) 48-45-15(e) requires a gamma ray – density log to be conducted to monitor the thickness of the salt roof on a regular schedule of every three (3) years if the salt roof thickness is greater than 50 feet but less than 100 feet in thickness and every five (5) years if the salt roof thickness is 100 feet or more. This log has been conducted for years and was also required under the previous set of regulations. This log commonly provides information pertaining to salt roof thickness, evidence of roof falls and washouts, effective casing seat location, and potential trapped product has been identified. The Kansas Department of Health and Environment (KDHE) currently receives a copy of the gamma ray – density log with an abbreviated interpretation and comparison of key depths to the last log that was performed. A simple, but useful interpretation of historical gamma ray – density results would be to map the cavern top and roof thickness over time to show any changes that may be occurring.

K.A.R. 28-45-15(f) requires a sonar survey be conducted on a regular schedule of every ten (10) years to determine the cavern's geometrics (dimensions, development, storage capacity, configuration and historical growth). Sonars can provide evidence of any possible changes that have occurred in the cavern, such as wall collapse, roof fall and convergence. Results from the sonar survey including the comparison of recent testing with historical results allow KDHE to track the following important cavern geometrics defined by the regulations: 1) minimum salt roof thickness of 100 feet; 2) identify and monitor any communication between caverns; 3) underground communication in the upper 50 feet of the salt formation; 4) horizontal distance of at least 100 feet between cavern boundaries; 5) maximum horizontal diameter of each cavern not to exceed 300 feet; 6) growth of a cavern resulting in a volume increase of 20 percent or more; and 7) overall cavern geometry indicating that the stability of the cavern or overburden is at risk. Historical interpretation and comparison will provide interested parties a better understanding of cavern growth, capacity and cavern field development.

THE IMPORTANCE OF INTERPRETATION AND HISTORICAL COMPARISON OF LOGGING RESULTS ON UNDERGROUND HYDROCARBON STORAGE WELLS AND CAVERNS—continued

K.A.R. 28-45-16(h) requires a casing evaluation, commonly performed by casing inspection logging (CIL), which is conducted to check for the internal and external corrosion of the production casing once every five (5) years if the well has single cemented casing or once every ten (10) years if the well has double cemented casing protection. This type of logging is very important to detect the presence of metal loss, the degree of penetration of the corrosion or casing defect, circumferential changes in the casing, or any other casing abnormalities or anomalies. KDHE regularly observes two types of CIL methods including acoustic imaging and magnetic flux, which is the most common method. The two methods characterize and classify each casing joint with a rating depending on the presence of corrosion or other issues. Wells that have casing defects of 20 percent or more metal loss are placed into enhanced monitoring which requires a higher frequency of logging. CILs are critical in determining if a casing needs corrective action such as liners to repair casing defects. KDHE commonly receives the current CIL log with a minimal interpretation of the log including the various classes of joints. Historical comparisons of the CILs would document the overall health of the well casing over time including documenting the success of any corrective action activities taken to repair the well casing.

K.A.R. 28-45-16(j) requires conducting a Cement Bond Log (CBL) with the CIL if a CBL has not been previously conducted. There are various types of CBL technology but the sonic cement bond log is commonly used. The primary purpose of these logs is to check the integrity of the cement behind the production casing or liner. The results from this log can be used in conjunction with the CIL to demonstrate the overall integrity and history of the well casing.

Industry hires consultants to perform required logging and interpret results which are then submitted to KDHE for review. KDHE relies on these logging experts to provide a comprehensive interpretation of the log and if corrective action is required on the well. As multiple cycles of logging are completed on a well/cavern it becomes even more significant that the logging expert provide a more descriptive and historical interpretation of the well/cavern by comparing the current results of the logging to past logs. The data and interpretation provided by both historical and current logging events provide industry and the KDHE with various lines of evidence that the well/cavern is being operated in an efficient and productive manner that is safe and protective of the public.

New Chief of Field Operations, Permitting, and Licensing Unit

by Jessica Crossman, PG

With the departure of Jeffrey Hand from the Geology and Well Technology Section at the end of 2014, I have taken over as the Unit Chief of the Field Operations, Permitting, and Licensing Unit. I am a licensed Professional Geologist and have worked for the State of Kansas for over 13 years. I actually began my career as a temporary employee in the Geology Section as an Environmental Technician in 2001 and worked with this group for two years while I was finishing my bachelor's degree at Emporia State University. Through this experience, I gained a strong background in the Underground Injection Control (UIC) and Underground Hydrocarbon Storage (UHS) Programs. Following graduation, I started a full time position working for the Kansas Corporation Commission (KCC) in Wichita, working in the Underground Porosity Gas Storage Program. Through my experience with the KCC, I gained extensive regulatory and Kansas structural geology experience, as well as a great deal of logging experience. I attended the Microline Vertilog Training in Traverse City, Michigan and spent countless hours witnessing these, as well as gamma-ray/neutron logs at porosity gas storage facilities in Kansas. In 2007, I returned to KDHE in the Bureau of Environmental Remediation (BER). In BER, I managed remediation projects at various contaminated sites throughout the state, including several at UHS Facilities, until returning to the Bureau of Water in February. As the Unit Chief of the Field Operations, Permitting, and Licensing Unit, I will be issuing permits and handling compliance for the UIC and UHS programs, managing the brine spill prevention and response program, and coordinating field activities for the Section, as well as assisting with technical/geologic reviews for the UIC and UHS programs requiring a Kansas Licensed Professional Geologist, including remediation projects. I am excited to be back and look forward to working with you all again.

WELCOME BACK



ATTENTION WATER WELL CONTRACTORS and Individuals who submit WWC-5 or WWC-5P Forms

KDHE will **no longer** be providing printed hard copies of the WWC-5 and WWC-5P forms. You will be able to submit these forms by using:

1. **KOLAR (Kansas On-Line Automated Reporting) system (if you are a licensed Kansas Water Well Contractor),** or
2. By filling out the .pdf fillable form on our Web site.

Both can be found at:

<http://kdheks.gov/waterwells>

If you are filling out the WWC-5 or WWC-5P forms, please submit:

1. **One** copy to KDHE at:

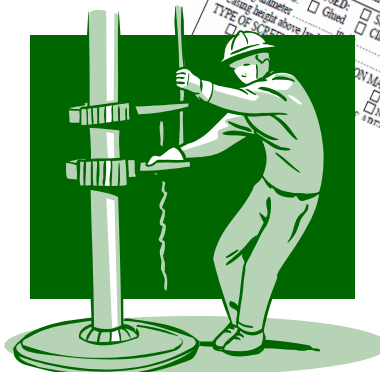
KDHE, GWTS
1000 SW. JACKSON STREET, STE. 420
TOPEKA, KS 66612-1367

2. One copy to water well owner
3. One copy for your files

There is a \$5.00 fee for each water well constructed and your check should accompany the WWC-5 form(s) when submitted.

There is no fee for Re-constructed wells and plugged wells

If you have questions,
Please call (785) 296-5524.





**Fall 2015 Seminar
and
Well Logging Workshop
by Debra Biester**

September 2 & 3

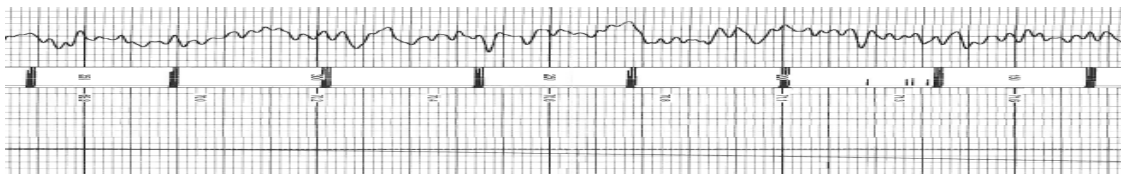


SAVE THE DATE

Kansas Department of Health & Environment (KDHE), Geology & Well Technology Section (GWTS) will host their Fall 2015 Seminar on Thursday, September 3, from 8 am to 4pm in the Sedgwick County Extension Education Center located at 7001 W 21st St. North, Wichita, Kansas. Featured topics will include: Injection Induced Seismicity, Brine Spill Soil Remediation, CO₂ Geosequestration, and Brine Contaminated Aquifer Remediation.

There will be a catered lunch by Hog Wild Pit Bar-B-Q, snacks, drinks and door prizes. You will receive a certificate at the conclusion of the seminar good for 6 hours credit towards CEUs.

The day prior to the seminar (at same location as seminar), there will be a Well Logging Workshop. Topics tentatively include Gamma Ray Log, Neutron Log, Casing Inspection Logs, Cement Bond Log, Cement Evaluation, Sonar Log and Formation Pressure Fall-off Test. The training will be held on Wednesday, September 2, 2015 from 8:30 am until 5:00 pm. in the stage half of the Ag Hall. Refreshments and snacks will be served. This event is free and is worth 6 credits towards your CEU. Certificates will be mailed out upon completion of the training event.



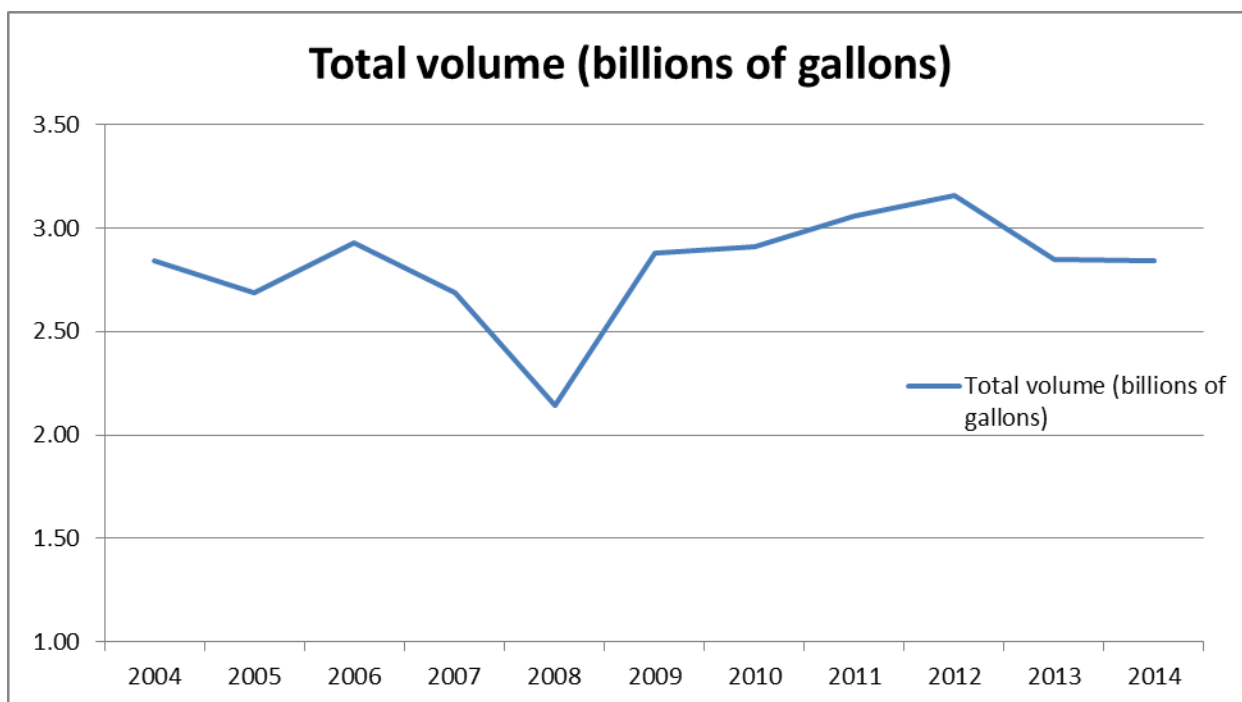
Check our Web site at <http://kdheks.gov/geo>
for seminar and workshop
details as they become available.

TRENDS IN CLASS I INJECTION 2004-2014

by Cynthia Khan, P.G.

The UIC Program has been collecting injection volume and other monitoring data, since inception of the program in 1983, and has been observing trends in the program.

Changes in the volume of wastewater injected into Class I disposal wells over the last ten years are presented in the following chart.

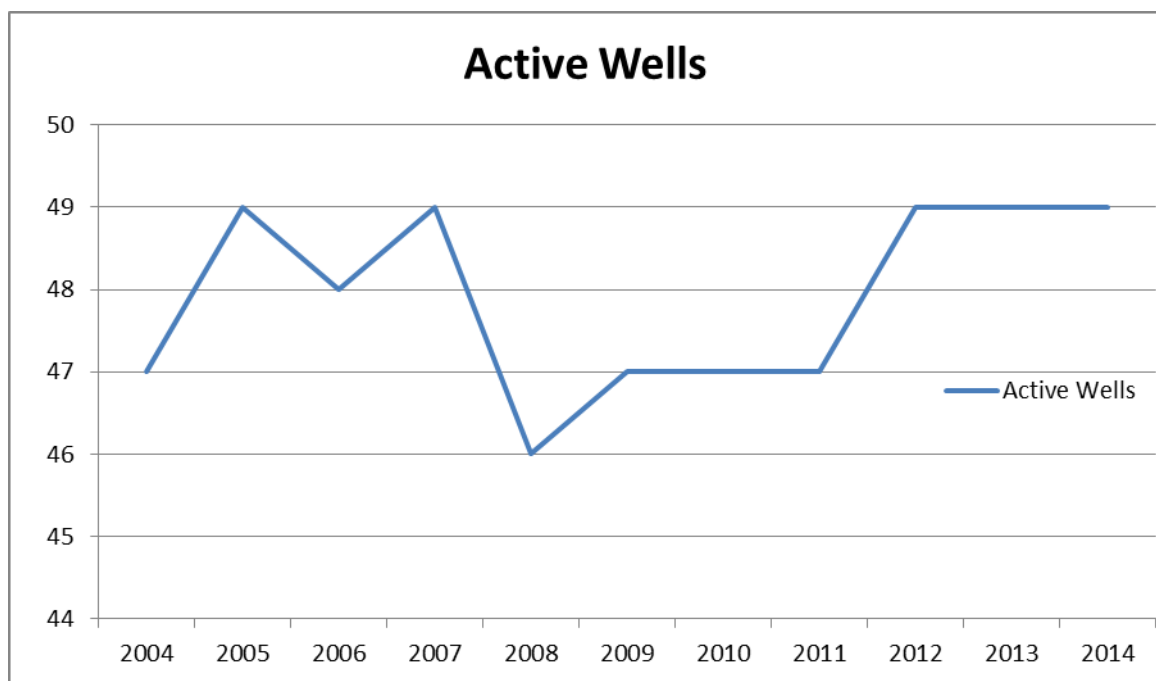


The dip in wastewater volume that is indicated during the year 2008 is the result of one primary factor: the closing of several high volume wells. The well count fell that year from a high of 49 to one of lowest counts of all years recorded: 46.

The total active well count is presented in the following chart. Of course, not all active wells are being fully utilized, so the well count can be deceptive when looking at the data generally.

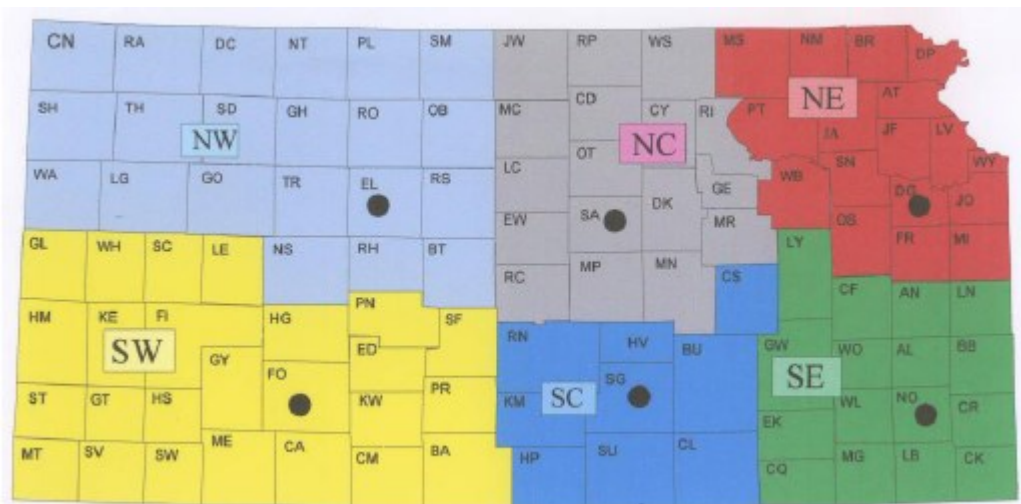
TRENDS IN CLASS I INJECTION 2004-2014—continued

by Cynthia Khan, P.G.



In 2012, several new large capacity wells were installed and put into operation. Since that time, both the well count and the injection volume has leveled off.

KDHE District Offices



Northwest District
785-625-5663
North Central District
785-827-9639
Northeast District
785-842-4600
Southwest District
620-225-0596
South Central District
316-337-6020
Southeast District
620-431-1211
Ulysses Satellite Of-
fice
620-356-1075
Topeka Office
785-296-5524

Geothermal Wells and the Potential to Encounter Oil and Gas or Saltwater Bearing Zones

by Richard Harper, PG

In Kansas closed loop geothermal systems are often drilled to depths of 200-400 feet. In certain parts of the state, at these depths there is the potential to encounter oil, gas or salt water bearing zones. When such zones are encountered, there is the risk to the environment and in some cases to the public health and safety. The integrity of the well grout used to prevent fluid migration in the borehole can also be compromised.

The well driller needs to be aware of the oil, gas or salt water zones that might be present at the project location so that these zones can be avoided. This may include the need to drill a test borehole to obtain hydrogeologic information and or a review of available information. KDHE has placed on its web site a, "Technical Assistance Bulletin" which addresses this issue. Additionally, the site show maps of oil and gas zones and salt water bearing zones that have been encountered at different depths. This document can be accessed at:

[GeothermalWellsTechAssistDoc2014.pdf](#)

Should an oil, gas and/or salt water zone be encountered during the drilling of a geothermal well, the zone must be isolated by cement from the remainder of the borehole to protect the public health, safety and the environment and the integrity of the borehole. The appropriate Kansas Corporation Commission (KCC) District Office should be contacted for assistance with the well plugging. The KDHE Water Well Program also must be contacted. KDHE met with several Kansas Licensed Water Well Contractors at the Kansas Ground Water Association's (KGWA) annual convention on January 23, 2015 to discuss the issue.

KDHE continues to work with the water well contractors to determine the most appropriate measures to address the potential to encounter oil, gas or salt water bearing zones when drilling a geothermal well. KDHE plans to meet with water well contractors to further discuss the issue.

Water Well Testing

KDHE Certified Laboratories Listing can be found at the following website:

<http://www.kdheks.gov/envlab/disclaimer.html>



KDHE OFFICE CLOSINGS FOR THE REMAINING 2015 CALENDAR YEAR

Monday, May 25—Memorial Day

Friday, July 3—Independence Day

Monday, September 7—Labor Day

Wednesday, November 11—Veteran's Day

Thursday, November 26—Thanksgiving

Friday, November 27—Thanksgiving

Thursday, December 24—Christmas

Friday, December 25—Christmas

Web News

The following changes have recently been made to the Geology and Well Technology Section Web site:

Geology (<http://kdheks.gov/geo>)

Remodeled Index Page

Updated Organizational Chart

Seminar and Training Courses

Earthquake Documents

UHS (<http://kdheks.gov/uhs>)

Remodeled Index Page

Proposed Environment Cleanup at Yaggy

Station Site

UIC (<http://kdheks.gov/uic>)

Remodeled Index Page

Draft Permits

Water Well (<http://kdheks.gov/waterwell>)

Updated Water Well Contractor List

Remodeled Index Page

UNDERGROUND NEWS

**Kansas Department of
Health and Environment**

**Prepared & Distributed by
Bureau of Water - Geology & Well
Technology Section**

**Direct inquiries and opinions to:
KDHE - BOW**

**Underground News
1000 SW Jackson, Suite 420
Topeka, KS 66612-1367**

The GWTS Web site has been remodeled by adding new headings and reorganizing the documents to enable a more user friendly site. The Water Well Index was the next remodel and the UHS and UIC Index Pages were slightly remodeled as they were already user friendly. We hope we have accomplished making your browsing experience easier.

KANSAS
DEPARTMENT OF
HEALTH AND
ENVIRONMENT

1000 SW Jackson St.
Suite 420
Topeka, KS 66612

785.296.5524 Office
785.296.5509 Fax

Web:
<http://kdheks.gov/geo>



Did You Know... ???

Groundwater—The Invisible and Vital Resource

In the United States:

- **76 Billion Gallons**
of groundwater are pumped each day
- **65 Percent** is used for irrigation
- **21 Percent** is used for public-supply
- **115 Million People**
rely on groundwater for drinking water
- **43 Million People**
rely on groundwater from private wells
- **1 of Every 5** groundwater samples from parts of aquifers used
for drinking water contained a contaminant from a geologic or
manmade source at a level of potential concern for human health
- **6,600 Wells**
were sampled for this study
- **1.3 Million Chemical Analyses**
were done for this study

KDHE STAFF

Mike Cochran, Section Chief, Scientist V/Geologist Geology & Well Technology Section	785.296.5560	mcochran@kdheks.gov
Debra Biester, Administrative Specialist	785.296.5524	dbiester@kdheks.gov
VACANT, Unit Chief, Geologist Water Well and Technical Support	785.296.3565	
Cynthia Khan, Unit Chief, Geologist, Underground Injection Control (UIC)	785.296.5554	ckhan@kdheks.gov
Rick Bean, Unit Chief, Geologist Underground Hydrocarbon Storage (UHS)	785.296.7254	rbean@kdheks.gov
Jessica Crossman, Unit Chief, Geologist Field Operations, Permitting, and Licensing	785.296.7265	jcrossman@kdheks.gov
Bailey Hockett, Part-Time Administrative Assistant	785.296.8565	bhockett@kdheks.gov

MEMBER:



***KDHE's Mission is to Protect and Improve the
Health and Environment of all Kansans***